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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/582,558	06/12/2006	Masayuki Tobita	1018.1232101	1707
28075 7590 03/04/2010 CROMPTON, SEAGER & TUFTE, LLC 1221 NICOLLET AVENUE SUITE 800 MINNEAPOLIS, MN 55403-2420				
EXAMINER				
FREEMAN, JOHN D				
ART UNIT		PAPER NUMBER		
1794				
MAIL DATE		DELIVERY MODE		
03/04/2010		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/582,558

Applicant(s)

TOBITA ET AL.

Examiner

John Freeman

Art Unit

1794

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 January 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) 6-10, 17-24 and 26-29 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 11-16 and 25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB06)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____
- Paper No(s)/Mail Date _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of group I in the reply filed on 21 Jan 2010 is acknowledged.
2. Claims 6-10, 17-24, and 26-29 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 21 Jan 2010.

Specification

3. The disclosure is objected to because of the following informalities: the specification describes formula (1) as

$$\alpha = (180 - \Delta\beta)/180$$

but it should read

$$\alpha = (180 - \Delta\beta)/180$$

For further discussion, see the rejections under 35 USC 112.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
5. Claims 1-5, 11-16, and 25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
6. The claims recite a formula describing the degree of orientation:

$$\alpha = (180 - \Delta\beta)/180$$

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However, the formula appears inaccurate. For α to be between 0.5 and 1, $\Delta\beta$ must have a value of over 32,000 degrees. The Certified Copy of the Foreign Priority Application appears to disclose in paragraph [0010] that the proper formula is

$$\alpha = (180 - \Delta\beta) / 180$$

which makes more sense. Applicant should correct the apparent typographical error in both the claims and specification.

Claim Rejections - 35 USC § 103

7. Claims 1-4 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Earls et al. (US 5,391,651).
8. Earls discloses liquid crystalline epoxy resins having mesogenic groups (col 1 ln 15-19). Molded articles made with the resin are reinforced by glass mats (col 33 ln 39-47). Such mats naturally arrange along a plane. Earls teaches the resins are oriented via magnetic fields (col 32 ln 42-65). Induced orientation improves unidirectional mechanical properties (col 2 ln 7-10). The examiner takes the position Earls's teaching of magnetic orientation either intrinsically satisfies Applicant's degree of orientation limitation, or otherwise would be obvious to one of ordinary skill in the art as Applicant claims a wide range, from little orientation at $\alpha=0.5$ to high orientation at $\alpha=1$, to improve the unidirectional mechanical properties of the composite. Such orientation of the molecular chains would necessarily result in an orientation direction that intersects with the plane defined by the mat. Note that an orientation that coincides with the plane still intersects the plane.
9. The examiner takes the position that one of ordinary skill seeking to create Earls's composite, and varying the level of orientation as described, would arrive at a composite intrinsically having the thermal expansion of coefficient properties presently claimed. Furthermore, such properties would be easily arrived at through routine experimentation involving changing the direction of the orientation of the molecular chains.

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10. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Earls et al. (US 5,391,651) in view of Akatsuka et al. (US 6,261,481).
11. Earls discloses an epoxy composite as previously described.
12. Earls is silent with regard to a printed wiring board.
13. The use of epoxy composites as the base for a printed wiring board was well known in the art at the time of the invention. For example, Akatsuka discloses liquid crystal epoxy resins (col 5 ln 28-32) as an insulating base for printed wiring board (col 13 ln 31-50). Such boards have conductive layers.
14. At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the composite taught by Earls as the base for a printed wiring board because of the epoxy resin's intrinsic insulative and orientation properties.
15. Claims 1-5, 11-16, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tobita (US 2003/0003287) in view of Akatsuka et al. (US 6,261,481).
16. Tobita discloses a heat conductive resin substrate having organic fibers oriented in a thickness and surface direction of the substrate [0013]. The substrate comprises liquid crystal polymers [0022]. The material is to be used for a printed circuit board, which have conductive layers [0027].
17. Tobita is silent with regard to liquid crystal epoxy resins, aromatic polyesters, or polyamides.
18. Akatsuka discloses a liquid crystal resin having an aromatic mesogen group (col 3 ln 50). Polymers containing the mesogen group include thermosetting epoxy resins (col 5 ln 28-32), and polyesters or polyamides (col 5 ln 24-25). Akatsuka's polymers have improved thermal conductivity (col 3 ln 4-10).
19. At the time of the invention, it would have been obvious to one of ordinary skill in the art to use an aromatic polyester or aromatic polyamide as taught by Akatsuka as the liquid crystal taught by Tobita to improve the thermal conductivity of the substrate.
20. Akatsuka discloses the molecular chains can be oriented via electric fields and notes the desirability of the highly oriented polymers (col 9 ln 27-42). At the time of the invention, it would have

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been obvious to one of ordinary skill in the art to orient the molecular chains to such a degree as to fall with the presently claimed broad range in order to improve the thermal properties of the substrate.

21. Tobita discloses the thermal conductivity of the substrate is greater along the orientation of the organic fiber [0016]. Akatsuka discloses the thermal conductivity is greater along the direction of the orientation of the molecular chains (col 9 ln 15-32). Note that by following Tobita's teaching of fibers oriented in the thickness direction, or both the thickness and surface directions, any oriented molecular chains would intersect with these fibers.

22. The examiner takes the position the substrate of Tobita in view of Akatsuka intrinsically meets the thermal expansion coefficient limitations presently claimed because the materials are the same as presently claimed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Freeman whose telephone number is (571)270-3469. The examiner can normally be reached on Monday-Friday 7:30-5:00PM EST (First Friday off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Callie Shosho can be reached on (571)272-1123. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

John Freeman
Examiner
Art Unit 1794

/John Freeman/
Examiner, Art Unit 1794

/Callie E. Shosho/
Supervisory Patent Examiner, Art Unit 1794